

REMARKS

Entry of the foregoing amendments is respectfully requested.

Summary of Amendments

Upon entry of the present amendments, claims 100 and 118 are cancelled, claim 139 is added and claims 70, 84, 99, 101, 119, 132 and 135 are amended, whereby claims 70-99, 101-117 and 119-139 will be pending. Claims 70, 84, 101, 119, 132 and 135 are independent claims.

Claim 139 (which replaces cancelled claim 100) and the amended claims find support throughout the present specification and in the original claims.

Applicants emphasize that the cancellation of claims 100 and 118 and the amendments to claims 70, 84, 99, 101, 119, 132 and 135 are without prejudice or disclaimer, and Applicants expressly reserve the right to prosecute the cancelled claims and the amended claims in their original, unamended form in one or more divisional and/or continuation applications.

Summary of Office Action

As an initial matter, Applicants note with appreciation that claims 98, 117 and 131 are indicated to be allowable over the prior art and that a number of the rejections set forth in the previous Office Action have been withdrawn (see pages 20-22 of the present Office Action).

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Claim 118 is objected to under 37 CFR 1.175(c) as being of improper dependent form for allegedly failing to further limit the subject matter of a previous claim.

Claims 70-138 are objected to under 37 CFR 1.75(i) as allegedly being of improper form because each of a plurality of elements or steps of a/the claim(s) should be separated by a line indentation.

Claims 75, 88-90, 108, 109 and 123 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for allegedly failing to comply with the written description requirement.

Claims 99 and 100 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for allegedly failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

Claims 70-83 and 132-134 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as allegedly being obvious over Finkelshtain et al., US 2002/0083640 A1 (hereafter "FINKELSHTAIN").

Claims 84-97, 99-116, 118-130 and 135-138 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over FINKELSHTAIN alone or in view of a newly cited document, i.e., Amendola et al., US 2002/0083643 A1 (hereafter "AMENDOLA").

Claims 70-83 and 132-134 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Suda, US 2002/0015869 A1 (hereafter "SUDA") alone or in view of AMENDOLA.

Claims 70-83 and 132-134 are rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as allegedly being

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obvious over Tsang, U.S. Patent No. 6,818,334 B2 (hereafter "TSANG I") alone or in view of AMENDOLA.

Claims 84-97, 99-116, 118-130 and 135-138 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over TSANG I or Tsang, EP 1369947 A2 (hereafter "TSANG II"), alone or in view of AMENDOLA.

Claims 70-83 and 132-134 are rejected under 35 U.S.C. § 102(a) as allegedly being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as allegedly being obvious over TSANG II alone or in view of AMENDOLA.

Response to Office Action

Reconsideration and withdrawal of the objections and rejections of record are respectfully requested in view of the following remarks.

Response to Objection to Claim 118 under 37 CFR 1.75(c)

Claim 118 is objected to under 37 CFR 1.175(c) as being of improper dependent form for allegedly failing to further limit the subject matter of a previous claim.

In this regard, Applicants note that claim 118 is replaced by new (process) claim 139 submitted herewith. Accordingly, this rejection is moot.

Applicants point out that the cancellation of claim 118 merely is to facilitate the prosecution of the present application and to expedite the issuance of a patent with the claims submitted herewith. Applicants do not agree with the Examiner in this regard and

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expressly reserve the right to prosecute claim 118 in one or more continuation and/or divisional applications.

Response to Objection to Claims under 37 CFR 1.75(i)

Claims 70-138 are objected to under 37 CFR 1.75(i) as allegedly being of improper form because each of a plurality of elements or steps of a/the claim(s) should be separated by a line indentation. The objection also refers to MPEP § 608.01(m) in this regard.

Applicants respectfully submit that both 37 CFR 1.75(i) and MPEP § 608.01(m) state that claims which recite a plurality of elements or steps of a/the claim(s) should (not must) be separated by a line indentation. Accordingly, it is not an absolute requirement to use line indentations in corresponding claims.

Applicants believe that the intelligibility of the objected claims would not be enhanced by line indentations, i.e., the claims are sufficiently intelligible in their present form and neither does the present Office Action allege that the present claims cannot readily be understood without line indentations.

For at least all of the foregoing reasons the present objection should be withdrawn, which action is respectfully requested.

Response to Rejection of Claims 75, 88-90, 108, 109 and 123 under 35 U.S.C. § 112, Second Paragraph

Claims 75, 88-90, 108, 109 and 123 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for allegedly failing to comply with the written description requirement. Specifically, the rejection asserts that the recited compound " $(\text{CH}_3)_3\text{NBH}_3$ " does not appear to have basis in the originally filed specification, including the claims.

This rejection is respectfully traversed. In this regard, Applicants note that the formula recited in the specification and the original claims, i.e., $(\text{CH}_3)_3\text{NHBH}_3$, is apparently incorrect in that this compound would not be a neutral compound but a positively charged species, i.e., $(\text{CH}_3)_3\text{NH}^+ \text{BH}_3$. Accordingly, one of skill in the art would readily understand that the compound actually intended is the well known complex of trimethylamine and borane. In support thereof, Applicants herewith submit a page downloaded from the Internet which shows this complex, i.e., <http://www.chemexper.com/index.shtml?main=http://www.chemexper.com/search/cas/75-22-9.html>¹.

Applicants submit that in view of the foregoing, the rejection of claims 75, 88-90, 108, 109 and 123 under 35 U.S.C. § 112, second paragraph, is unwarranted, and withdrawal thereof is respectfully requested.

¹ In accordance with M.P.E.P. § 609C(3), the document cited above in support of Applicants' remarks is being submitted as evidence directed to an issue raised in the mentioned Official Action, and no additional fee or Certification pursuant to 37 C.F.R. §§ 1.97 and 1.98, or citation on a FORM PTO-1449 is believed to be necessary.

Response to Rejection of Claims 99 and 100 under 35 U.S.C. § 112, Second Paragraph

Claims 99 and 100 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for allegedly failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. With respect to claim 99, the rejection alleges that "the at least one second component" recited in line 2 thereof does not have sufficient antecedent basis.

With respect to claim 100, the rejection alleges that the term "obtainable" is indefinite.

Applicants submit that claim 99 has been amended and claim 100 has been cancelled, wherefore this rejection is moot.

Applicants emphasize that the cancellation of claim 100 merely is to facilitate the prosecution of the present application and to expedite the issuance of a patent with the claims submitted herewith. Applicants do not agree with the Examiner in this regard and expressly reserve the right to prosecute claim 100 in one or more continuation and/or divisional applications.

Response to Rejection of Claims 70-83 and 132-134 under 35 U.S.C. §§ 102(b)/103(a) over FINKELSHTAIN

Claims 70-83 and 132-134 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as allegedly being obvious over FINKELSHTAIN. The rejection essentially repeats the arguments set forth with respect to the corresponding original claims set forth in the previous Office Action.

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In particular, the rejection alleges that because FINKELSHTAIN suggests employing basic solutions for stability, and suggests employing 6M hydroxide ions for optimal electrical output it would have been obvious to one of ordinary skill in the art to dilute a storage stable concentrate having a high pH to a concentration of 6M KOH before using it as a liquid fuel.

This rejection is respectfully traversed (again). In addition to the arguments set forth with respect to the rejection of the corresponding original claims 28-38 and 69 over FINKELSHTAIN, which arguments are incorporated herein in their entirety, it is pointed out that even if one were to assume, *arguendo*, that the statement in paragraph [0020] of FINKELSHTAIN that BH_4^- is stable (against spontaneous decomposition) in basic solutions is to be taken as a suggestion that there is a relationship between stability and degree of basicity (alkalinity) of the fuel, and that this (presumed) suggestion would motivate one of ordinary skill in the art to provide storage stable compositions of borohydride salts by using solutions having a basic pH (i.e., higher than pH 7), this would not motivate one of ordinary skill in the art to prepare a borohydride composition with a KOH concentration of higher than 6M and to dilute this concentrate before use to a concentration of 6M KOH.

Specifically, one of ordinary skill in the art would recognize that a borohydride composition which contains 6M KOH is strongly basic ($\text{pH} > 14$) and should, thus exhibit sufficient (long-term) stability for storage purposes without the presence of any additional KOH (or any other alkaline compound). Accordingly, there is no motivation for one of ordinary skill in the art to increase the KOH concentration of a metal borohydride

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composition beyond 6M in order to provide a storage stable concentrate which is to be diluted before use (e.g., to 6M KOH). In other words, even if one were to share the Examiner's analysis of the disclosure of FINKELSHTAIN and the conclusions drawn on the basis of this analysis, it is not seen that there is any motivation to prepare a metal hydride fuel concentrate and combine it with a solvent for dilution as it is recited in the rejected claims.

In view of the foregoing Applicants respectfully submit that the present rejection is based on hindsight. FINKELSHTAIN does not teach or suggest diluting a fuel concentrate with solvent in order to prepare a fuel for use in a direct liquid fuel cell as it is recited in present independent claims 70 and 132. FINKELSHTAIN also does not teach or suggest raising the hydroxide ion concentration of a borohydride fuel beyond the concentration which is considered ideal for the operation of the fuel cell at ambient temperatures (i.e., 6 M), let alone in order to increase the stability of the borohydride compound.

Without these suggestions, there is no motivation for one of ordinary skill in the art to make an extra effort to first prepare a fuel concentrate and to thereafter dilute the concentrate with a solvent.

For at least all of the foregoing reasons, FINKELSHTAIN neither anticipates nor renders obvious the subject matter of any of the claims submitted herewith, wherefore the present rejection is without merit and should be withdrawn, which action is respectfully requested.

Response to Rejection of Claims under 35 U.S.C. § 103(a) over FINKELSHTAIN in View of AMENDOLA

Claims 84-97, 99-116, 118-130 and 135-138 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over FINKELSHTAIN alone or in view of AMENDOLA.

In this regard, the rejection asserts that it would have been obvious to one of ordinary skill in the art "to 'package' or 'container' the obvious or anticipated storage stable concentrate with the necessary solvent for obtaining the acknowledged optimal 6M fuel mixture because: (1) such avoids problems of dosing the proper amounts of the two components by the end user; (2) such avoids problems of dosing with impure solvent." Paragraph bridging pages 14 and 15 of present Office Action. To the extent that the claims require a pH not suggested by FINKELSHTAIN, the rejection relies on paragraph [0033] of AMENDOLA (according to which the metal hydride solution described therein most preferably has a pH greater than about 14).

This rejection is respectfully traversed as well. As set forth above in detail, FINKELSHTAIN does not provide any motivation with respect to the preparation of a fuel concentrate and the dilution thereof with a solvent. Without this motivation, there is no motivation to provide a container or a packaged combination of containers comprising both a fuel concentrate and a solvent for dilution of the concentrate to afford a hydroxide ion concentration of the diluted concentrate which is lower than that of the concentrate, as recited in the rejected claims. As pointed out above, the preferred ready-for-use borohydride fuel of FINKELSHTAIN has a pH above 14 (due to a KOH

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concentration of 6M), wherefore one of ordinary skill in the art would not have any concerns regarding the storage stability of this fuel.

AMENDOLA does not add anything to the disclosure of FINKELSHTAIN in that the most preferred pH according to AMENDOLA (greater than about 14) is already embodied in the 6M KOH fuel of FINKELSHTAIN.

For at least all of the foregoing reasons, the rejection of claims 84-97, 99-116, 118-130 and 135-138 under U.S.C. § 103(a) over FINKELSHTAIN alone or in view of AMENDOLA is unwarranted, wherefore withdrawal thereof is respectfully requested.

Response to Rejection of Claims under 35 U.S.C. § 103(a) over SUDA in View of AMENDOLA

Claims 70-83 and 132-134 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over SUDA alone or in view of AMENDOLA. The rejection refers to Example 1 of SUDA which allegedly discloses a composition comprising about 7.5 M KOH and 2 weight % KBH_4 . The rejection further relies on paragraph [0050] of SUDA which mentions concentrations of the metal-hydrogen complex compound dissolved in an aqueous alkaline solution in the range of from 0.1 to 50 % by weight and asserts that in view thereof, it would allegedly have been obvious to one of ordinary skill in the art "to vary the amounts of components and thus arrive at the subject matter encompassed by Applicant's claims" and "to have employed concentrations anywhere within the ranges suggested to have made less concentrated ones from more concentrated ones as an

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obvious expedient". To the extent that the claims require a pH not suggested by SUDA, the rejection relies on paragraph [0033] of AMENDOLA.

Applicants respectfully traverse this rejection as well. In particular, in addition to the arguments set forth with respect to the rejection of the corresponding original claims 28-38 and 69 over SUDA, which arguments are incorporated herein in their entirety, it is pointed out that the Examiner's reliance on the statement in paragraph [0050] of SUDA is obviously based on hindsight.

Specifically, this statement merely informs the reader of the concentration range for the metal-hydrogen complex (i.e., usually from 0.1 to 50 percent by weight) which the inventor of SUDA considers to be suitable for the liquid fuel described therein. According to SUDA, the indicated range is suitable "in consideration of the desired power generating capacity of the liquid fuel cell and the solubility behavior of the complex compound in the aqueous alkaline solution". In other words, lower concentrations of the metal-hydrogen complex than 0.1 % by weight would usually not afford the desired power generating capacity and higher concentrations than 50 % by weight would usually result in problems with respect to the dissolution of the complex compound in the aqueous alkaline solution.

Clearly, it corresponds to usual practice to indicate suitable concentration ranges of compounds described in patent applications (and to give the reasons therefor). In fact, SUDA appears to indicate concentration ranges not only for the metal-hydrogen complex, but also for other compounds and components which are necessary or at least

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desirable for carrying out the invention disclosed therein. See, e.g., paragraphs [0049] and [0055] of SUDA.

An indication that a certain concentration range is suitable does not automatically provide a motivation to prepare a composition having a concentration within the indicated range and to dilute this composition in order to obtain one or more less concentrated compositions within the indicated range.

SUDA does not contain any invitation whatsoever to proceed in the manner envisaged by the Examiner (i.e., to prepare one or more dilutions of a stock solution), and neither is a corresponding procedure described in any of the Examples of SUDA (or in any of the other documents cited by the Examiner).

For at least all of the foregoing reasons, SUDA fails to render obvious the subject matter of any of claims 70-83 and 132-134.

AMENDOLA does not add anything to the disclosure of SUDA in that the 7.5 M KOH solution of Example 1 of SUDA postulated by the Examiner can safely be assumed to have a pH of greater than 14, i.e., the most preferred pH according to AMENDOLA. In view thereof, withdrawal of the rejection under 35 U.S.C. § 103(a) over SUDA in view of AMENDOLA is warranted and respectfully requested.

Response to Rejection of Claims under 35 U.S.C. §§ 102(e)/103(a) over TSANG I in View of AMENDOLA

Claims 70-83 and 132-134 are rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as allegedly being

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obvious over TSANG I alone or in view of AMENDOLA. The rejection alleges that TSANG I “discloses the production of two solutions, one comprising metal boro-hydride, water, and hydroxide, the other comprising water, which are then combined thus diluting each and which then forms a mixture used as a fuel in a fuel cell (column 1, lines 42 to column 2, line 34, column 3, line 54 to column 4, line 45)”. Emphasis added; page 16, next-to-last paragraph of Office Action.

This rejection is respectfully traversed as well. Applicants fail to see where in TSANG I it is disclosed that the “mixture” referred to by the Examiner is used as a fuel in a fuel cell. On the contrary, TSANG I makes it abundantly clear that this “mixture” is not used as a fuel, let alone as a fuel in a fuel cell, but merely serves as a source of hydrogen gas. That is, the borohydride in the corresponding mixture, when contacted in a reaction chamber with a suitable catalyst, is decomposed to form, *inter alia*, hydrogen which in turn is transferred to a fuel cell and used therein as the actual fuel. In this regard, the title, the abstract and col. 4, lines 54-61 of TSANG I may, for example, be referred to.

In comparison, present independent claims 70 and 132 are drawn to “a process for preparing a metal hydride containing liquid for use as a fuel in a direct liquid fuel cell from a storage-stable concentrate” and “a method of reducing the decomposition of a fuel for a direct liquid fuel cell during storage of the fuel”, respectively. In other words, the metal hydride containing compositions of independent claims 70 and 132 are the actual fuel, i.e., not just a means for generating hydrogen which in turn can be used in a fuel which operates with hydrogen as the fuel.

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Further, TSANG I neither teaches nor suggests to prepare a fuel concentrate for a direct liquid fuel cell, let alone to dilute this concentrate before use in order to prepare the actual fuel. Paragraph [0033] of AMENDOLA does not add anything to the disclosure of TSANG I in that the former merely indicates a most preferred pH of greater than 14 for a borohydride containing solution.

For at least all of the foregoing reasons, TSANG I, alone or in combination with AMENDOLA, fails to anticipate or render obvious the subject matter of any of the present claims. Accordingly, the rejection of claims 70-83 and 132-134 under 35 U.S.C. § 102(e)/103(a) TSANG I/AMENDOLA is without merit and should be withdrawn, which action is respectfully requested.

Response to Rejection of Claims under 35 U.S.C. §103(a) over TSANG I or TSANG II in View of AMENDOLA

Claims 84-97, 99-116, 118-130 and 135-138 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over TSANG I or TSANG II (a family member of TSANG I), alone or in view of AMENDOLA. The rejection is based on an incorrect assumption regarding an alleged anticipation of the subject matter of claims 70-83 and 132-134 by TSANG I set forth above. In particular, the Examiner incorrectly assumes that the metal borohydride containing "mixture" of TSANG I/TSANG II is used (as such) as a fuel for a fuel cell. However, as explained above, the mixture of TSANG I/TSANG II merely serves as a means for storing hydrogen gas from which the latter is liberated by catalyzing the decomposition of the borohydride. This is one of the reasons why one of

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ordinary skill in the art would not be motivated to "package" or "container" the first and second solutions referred to in, for example, claim 1 of TSANG I.

Specifically, the "mixture" of TSANG I/TSANG II which can be made from the first and second solutions is not useful as such and is merely used to generate hydrogen for a hydrogen-based fuel cell. In order to generate hydrogen, the "mixture" has to be contacted with a catalyst. The contacting of the "mixture" with a catalyst and the handling (e.g. transfer) of the resultant hydrogen gas require equipment which is complex and of a considerable size. Also, the amount (volume) of the "mixture" which is required to generate an amount of hydrogen gas which is sufficient for operating a technically useful hydrogen-based fuel cell is considerable (in this regard, it is noted that according to col. 3, lines 54-61 of TSANG I, at a concentration of 20 wt % of NaBH_4 , solution A has a hydrogen content of (only) 6 wt %). Furthermore, a corresponding process would preferably be operated continuously, rendering a prepackaged amount of "mixture" virtually useless.

The above facts are illustrated, for example, by the statements in col. 4, lines 35-45 of TSANG I, according to which the best mode to practice the embodiments disclosed therein is to meter Solution A and Solution B independently by two separate mechanical devices, i.e., pumps, into a chamber that contains the catalyst. The pump rates are selected such that the desired molar ratio of water and NaBH_4 is accomplished. The reaction rate may further be accelerated by heating the reaction chamber externally by a capacitor or other electronic device.

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In view of the above-mentioned circumstances, it would obviously not serve any useful purpose to prepackage the first and second solutions of TSANG I/TSANG II. For example, merely combining the prepackaged solutions would not result in a mixture that is useful as such. Further, the containers that would be required to prepackage volumes of the solutions which would result in the generation of a useful amount of hydrogen for the (discontinuous) operation of a hydrogen-based fuel cell of acceptable size and output would apparently be huge. Accordingly, there is no motivation for one of ordinary skill in the art to prepackage the solutions of TSANG I/TSANG II for mixing before use. Paragraph [0033] of AMENDOLA does not add anything to the disclosure of TSANG I/TSANG II in that the former merely indicates a most preferred pH of greater than 14 for a borohydride containing solution.

For at least all of the foregoing reasons, TSANG I/TSANG II in view of AMENDOLA do not render obvious the subject matter of any of the present claims. Accordingly, the rejection of claims 84-97, 99-116, 118-130 and 135-138 under 35 U.S.C. § 103(a) over TSANG I or TSANG II, alone or in view of AMENDOLA is unwarranted, wherefore this rejection should be withdrawn.

***Response to Rejection of Claims under 35 U.S.C. §§ 102(a)/103(a) over TSANG II
in View of AMENDOLA***

Claims 70-83 and 132-134 are rejected under 35 U.S.C. § 102(a) as allegedly being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as allegedly being obvious over TSANG II alone or in view of AMENDOLA.

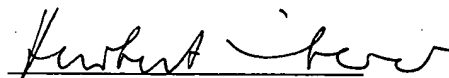
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This rejection parallels the rejection of the same claims over TSANG I (a family member of TSANG II) alone or in view of AMENDOLA. For this reason and in order to avoid unnecessary repetition, Applicants expressly refer to the comments set forth above with respect to the latter rejection, which comments are incorporated here. Accordingly, this rejection is traversed as well and withdrawal thereof is respectfully requested.

CONCLUSION

In view of the foregoing, it is believed that all of the claims in this application are in condition for allowance, which action is respectfully requested. If any issues yet remain which can be resolved by a telephone conference, the Examiner is respectfully invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,
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Search Chemicals

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Borane-trimethylamine
complex
Trimethylamine borane
Boron hydride-trimethylamine
Borane-trimethylamine-
complex
Borane trimethylamine
complex

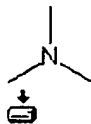
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IR: Show

3D Show
model: Show

Hazard: F XI

Risk: 11 36/37/38

Safety: 16 26 33 36/37/39

MSDS: EN